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over an entire period by their use. I had marked a large number of penetrating purviews and new reflections for quotation, but limits of space forbid more than briefest reference to a very few. The theory of curves of thought (43); the value of monastic influences (71); the contrasts between communal and family life (81, 192, etc.); the relation of Catholicism and Protestantism to vice and crime (94); the misfortunes of the Reformation (104); the suddenness of English civilization (126); Locke's office (162); the meaning of Deism (175); the contrast between England and France (187, 281); the presentations of Wesley and Whitefield (250); the 'origins' of Adam Smith (264); the criticism of current sociology (333); Romanticism and religion (353)—all serve to illustrate the originality and one might almost say weird suggestiveness of Professor Patten's inferences, and other instances might be adduced indefinitely.

On the other hand, a few things give one pause. To begin with, Professor Patten will perhaps not take it amiss if a Scot informs him that Scottish thought is not a variant of English. Hume and Adam Smith and the Mills would not have been what they were had their nationality lain south of the Tweed. At the same time, I am well aware how difficult it is for the foreigner to understand that the Cheviots divide, if not two civilizations, then two ways of thinking. The doctrine of the 'manly man,' the 'womanly man,' and so forth (255, 318, 341, etc.), seems a little far-fetched to be made so much of; perhaps it applies in the case of John Stuart Mill. The bath theory (192) of English civilization; the treatment of Calvinism (110, etc.); the contrast between Cavalier and Puritan (119); the gulf between the upper and lower classes in England (130); the emphasis upon clothing (191); the passage from a liquor to a sugar diet (381)—all seem to me to be somewhat fanciful or, at least, to be used in support of conclusions which do not necessarily connect with them. Many of the 'Concluding Remarks' are vitiated by the author's foreign standpoint. For example, the identification of religion and economics, while strikingly true of the United States, is incomparably less true of England, and must remain so till the Anglican Church loses its endowments. I ought to add

that some of these objections would probably appear less forcible to one fully informed on economic questions.

Finally, the appreciations of English philosophical thought are wholly admirable. The value of the new lights cast on Locke (158), Mandeville, Hume (215, 223), the Mills, especially the son (331), Darwin (345), and the present position of English philosophy (377) and religion (398), cannot be overestimated at the contemporary juncture. Emphasis ought to be laid on the masterly discussions of Ricardo and Adam Smith; the interpretation of the former is most illuminating.

So far as I am capable of judging, the book is obviously the work of a very able man and one unusually well informed; of a man who has extraordinary capacity for seeing and telling truths pointedly, even though he may miss the whole truth time and again. In any case, it must be reckoned with and cannot miss the exercise of wide influence, whether this be of a negative or positive character.

R. M. WENLEY.

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Peruvian Meteorology, 1888-1890. Compiled and prepared for publication by SOLON I. BAILEY, under the direction of EDWARD C. PICKERING. Annals of the Astronomical Observatory of Harvard College, Vol. XXXIX., Part I. 4to. Cambridge, Published by the Observatory. 1899. Pp. 153. Pls. VI.

It is safe to say that no publication has been awaited with greater interest among meteorologists than the volume now before us. Ever since the establishment of the permanent Southern Station of the Harvard College Observatory at Arequipa, in 1891, and of the auxiliary meteorological stations in connection with it, every meteorologist the world over has been anxious to have access to the data which have been gathered concerning the climatic conditions of that unique region. The notable discoveries made on the photographic plates from Arequipa have turned the attention of every astronomer towards Peru. Now the meteorological world likewise turns towards Peru in the study of the records which are for the first time accessible. Readers of SCIENCE will remember that the

astronomical and meteorological work of the Observatory of Harvard College in Peru is the result of a bequest left to the Observatory in the will of Mr. Uriah A. Boyden, in 1887. Under the terms of the will this money was to aid in the establishment of an observatory "at such an elevation as to be free, so far as practicable, from the impediments to accurate observation which occur in observatories now existing, owing to atmospheric influences." It was in connection with the study of the atmospheric conditions of the desert strip of the west coast of South America, with a view to determining the best possible site for the new observatory, that the early meteorological observations in Peru were undertaken. The stations selected for the taking of these preliminary observations were Mollendo, Arequipa, Vincocaya, Puno and Chosica. The first four stations are between latitude S. $15^{\circ} 40'$ and S. $17^{\circ} 5'$, on the *Ferrocarril del Sur del Peru*, which runs from Mollendo, on the sea coast, northeast to Puno, on Lake Titicaca, a distance of 325 miles (by rail). Mollendo is immediately on the coast (altitude 80 feet). Arequipa is at a distance of 80 miles in a direct line from the Pacific Ocean, at an altitude of 7,550 feet. Vincocaya is 14,360 feet above sea level, on a desolate plateau, near the crest of the Western Cordillera. Puno (12,540 feet) is on the western shore of Lake Titicaca. The station at Chosica was situated about 25 miles northeast of Lima (altitude 6,600 feet). A few observations, chiefly of cloudiness, were made at the Pampa Central, near the central western part of the Desert of Atacama, in Chile.

These early observations were made during the years 1888-1890, with more or less completeness. They are, however, preliminary. They were almost all made by observers who had had little or no experience and who received no compensation for their services. The instrumental equipment in use at the different stations varied considerably; the hours of observation were not always the same; the location of the instruments was sometimes changed. In short, the work as a whole was done in an unsystematic and incomplete and often in a very inaccurate way. This was, of course, absolutely unavoidable. It was impossible to secure

trained observers, to inspect the stations, or to test the instruments. The observations were, therefore, liable to be considerably in error. Thus, in connection with the minimum thermometer readings at Chosica the statement is made in a note that it is probable that the lower end of the index in the minimum thermometer was read, instead of the upper end. And in the wind observations at Arequipa and Vincocaya it is noted that "the direction of the wind was always given, even if the remark appended was 'calm' or 'dead calm.' Apparently the position of the wind-vane was recorded, whether at the time wind was observed or not." These two cases will serve to indicate the sort of errors which inevitably appear in these records. We do not intend to criticise adversely the publication of these early Peruvian observations, but merely to point out their necessary inaccuracies. Professor Pickering says very clearly in the preface: "These observations must not be regarded as indicating the accuracy of those made later. * * * It must be remembered that it was not possible under the conditions then existing to obtain observations of the accuracy of those made by professional observers at permanent and easily accessible observatories." And again, on page 68, Professor Bailey says: "The results are perhaps as reliable as are possible in such outlying stations, where experienced observers cannot be obtained and frequent supervision is impossible."

The published observations comprise twenty-nine tables. The data are by no means equally complete for all stations. At Mollendo, Arequipa and Vincocaya the instruments in use were the maximum, minimum and ordinary thermometers, thermograph and rain-gauge. At Arequipa a solar radiation and a wet-bulb thermometer were also used. At Puno the observations were continued but a short time, and there was no thermograph. At the Chosica station, in addition to the above-named instruments, there were a barograph, sunshine and pole-star recorder. At Pampa Central cloud observations only were made, four times daily. There are several tables showing the hourly means of the barograph and thermograph, and a comparison of thermometer and thermograph hourly and monthly means. Curves are also-

given showing the diurnal variation of temperature at Mollendo, Arequipa, Vincocaya and the Chosica station; the diurnal variation of pressure for the Chosica station, and the annual range of the afternoon oscillation of pressure at the Chosica station. Beyond some general remarks in explanation of the tables, there is no discussion of the observations.

Besides the meteorological portion proper, this volume contains a very attractive account, by Professor Bailey, with some excellent illustrations, of the volcano El Misti (19,200 feet), and of the establishment of the now famous Misti meteorological station on its summit. There is also a carefully compiled account of *The Configuration and Heights of the Andes*, which will be of distinct value to geographers.

We presume that Professor Pickering may receive some rather severe criticism in certain quarters for the publication of meteorological data which are so incomplete and which, doubtless, have very many inaccuracies. But we agree with him in believing that, considering the interest of the region in which these observations were made, and the lack of information concerning its meteorology, such results deserve publication, provided careful statement is made in regard to the circumstances under which the data were collected. Professor Pickering and Professor Bailey have both made these conditions perfectly clear, and we believe that the results, when viewed in the light of these statements, will prove not only of great interest, but also of great value.

R. DEC. WARD.

The Elements of Physical Chemistry. By J. LIVINGSTON R. MORGAN, PH.D., of the Department of Physical Chemistry, Columbia University. First edition, first thousand. New York, John Wiley & Sons; London, Chapman & Hall, Limited. 1899. Pp. 299.

This little book deals with the gaseous state, the liquid state, the solid state, solution, the rôle of the ions in analytical chemistry, thermochemistry, chemical change, including equilibrium and chemical kinetics, phases and electrochemistry.

The aim of the author is to present the elements of physical chemistry in brief form to

those who do not have the time or opportunity to go more extensively into the subject. An examination of the work will bring out much that is of interest and importance, and a careful study of it will help a beginner to obtain an insight into the subject. But the objection might be raised to the work as a whole that it seems to deal rather with conclusions and generalizations than with the evidence upon which such are based. Further, there are many omissions which it is difficult to account for. Thus, under liquids no mention is made of Kopp's work on atomic volumes; of the work of Pulfrich, Landolt, Gladstone, Brühl and others, on the refractivity of liquids; of the rotation of the plane of polarized light and the Le Bel-Van't Hoff hypothesis; of the work of Perkins, and of Rodger and Watson on magnetic rotation; of Thorpe and Rodger on viscosity; of Ramsay and Shields on the surface-tension of liquids as applied to the determination of molecular weights. It would seem that such important work as the above ought to be referred to briefly even in an elementary treatise designed to cover the whole field of physical chemistry. An examination of the book will show, further that much of the more recent experimental work has not been taken into account, indicating that text-books which have been published several years, rather than the original literature, have been drawn upon as the source of material. As in most text-books, so here, an occasional statement is not quite accurate. But what book is perfectly logical, thoroughly comprehensive and rigidly exact throughout?

HARRY C. JONES.

BOOKS RECEIVED.

The Anatomy of the Central Nervous System of Man and of Vertebrates in General. LUDWIG EDINGER. Translated from the fifth German edition by WINFIELD S. HALL, assisted by P. L. HOLLAND and E. P. CARLTON. Philadelphia, F. A. Davis Company. 1899. Pp. xi + 446.

Marriages of the Deaf in America. EDWARD ALLEN FAY. Washington, Gibson Bros. 1898. Pp. vii + 527.

A Century of Vaccination. W. SCOTT TEBB. London, Swan, Sonnenschein & Co. 1899. Second Edition. Pp. 452.